

In the Claims:

1. (Currently Amended) A method of fabricating a semiconductor device, the method comprising:

providing a workpiece;

disposing a first dielectric material over the workpiece;

disposing a second dielectric material over the first dielectric material, the second dielectric material defining a top surface and comprising a different material with different etching characteristics than the first dielectric material, wherein the first dielectric material and the second dielectric material comprise a first insulating layer; [[and]]

forming a first pattern in the first dielectric material by a first etching process, said first etching process selective to said second dielectric material, and forming a second pattern in the second dielectric material by a second etching process, said second etching process selective to said first dielectric material, the second pattern being different from the first pattern; and

depositing a conductive material over the patterned second dielectric material and the patterned first dielectric material, wherein said first dielectric material has a coefficient of thermal expansion (CTE) substantially similar to the CTE of the conductive material.

2. (Cancelled)

3. (Currently Amended) The method according to Claim 1 further comprising 2, wherein removing the conductive material from the top surface of the second dielectric material to form ~~comprises forming~~ conductive lines in the second pattern of the second dielectric material.

4. (Currently Amended) The method according to Claim 1 ~~[[2]]~~, wherein the conductive material forms vias in the first pattern of the first dielectric material.
5. (Original) The method according to Claim 4, wherein the vias comprise substantially vertical sidewalls.
6. (Original) The method according to Claim 4, wherein the workpiece comprises component regions, wherein at least one of the vias makes electrical contact with a component region of the workpiece.
7. (Original) The method according to Claim 6, wherein the workpiece component regions comprise a plurality of conductive lines formed in a dielectric layer.
8. (Currently Amended) The method according to Claim 7, wherein the conductive lines comprise copper, ~~wherein disposing the first dielectric material comprises disposing a material having a coefficient of thermal expansion (CTE) close to the CTE of the first conductive lines.~~
9. (Original) The method according to Claim 1, further comprising:
depositing a hard mask over the second dielectric material.

10. (Original) The method according to Claim 9, wherein depositing the hard mask comprises:

- depositing a first mask layer;
- depositing a second mask layer over the first mask layer; and
- depositing a third mask layer over the second mask layer.

11. (Original) The method according to Claim 10, wherein depositing the first mask layer comprises depositing SiC_x , SiC_xN_y , SiC_xH_y , $\text{SiC}_x\text{N}_y\text{H}_z$, or SiCOH , wherein depositing the second mask layer comprises depositing Si_xN_y or SiO_2 , and wherein depositing the third mask layer comprises depositing a refractory metal nitride.

12. (Original) The method according to Claim 11, wherein depositing the first mask layer comprises depositing a layer of SiC_x and a layer of N-SiC_x over the layer of SiC_x .

13. (Original) The method according to Claim 10, wherein forming the first pattern and the second pattern comprises:

- patterning at least the third mask layer with the second pattern;
- patterning the third mask layer, the second mask layer and the first mask layer with the first pattern;
- transferring the first pattern to the second dielectric material;
- removing the third mask layer, the second mask layer and the first mask layer in the second pattern regions;
- transferring the first pattern to the first dielectric material; and
- removing the second dielectric material in the second pattern regions.

14. (Original) The method according to Claim 13, further comprising disposing the semiconductor device in a processing chamber before disposing the first dielectric material over the workpiece; and before removing the second dielectric in the second pattern regions, cleaning the processing chamber while the wafer remains in the processing chamber without etching a material layer of the semiconductor wafer.

15. (Original) The method according to Claim 14, wherein cleaning the processing chamber comprises introducing a plasma cleaning gas comprising O₂ gas diluted in Ar, He, or N₂, and wherein the plasma cleaning gas removes polymer build-up on the processing chamber walls.

16. (Original) The method according to Claim 15, further comprising only applying power to an electrode in the chamber during cleaning, wherein the workpiece is not biased during the cleaning method, and wherein the plasma electrode power density applied comprises about 0.1 W/cm² to 10 W/cm² at a pressure of about 50 mTorr to 500 mTorr.

17. (Original) The method according to Claim 13, further comprising, before removing the second dielectric in the second pattern regions, moving the workpiece to a clean processing chamber.

18. (Original) The method according to Claim 13, further comprising:
depositing a cap layer over the workpiece, before disposing the first dielectric material;
and
transferring the first pattern to the cap layer.
19. (Original) The method according to Claim 18, further comprising forming an adhesion film over a top surface of the cap layer.
20. (Original) The method according to Claim 1, further comprising forming an adhesion film disposed over a top surface of the first dielectric layer.
21. (Original) The method according to Claim 13, wherein forming the first pattern and the second pattern further comprises:
after patterning at least the third mask layer with the second pattern, depositing an anti-reflective coating over the third mask layer;
depositing a photoresist layer over the anti-reflective coating;
patterning the photoresist layer with the first pattern; and
transferring the first pattern in the photoresist layer to the third mask layer, the second mask layer, the first mask layer, and the second dielectric layer.
22. (Original) The method according to Claim 1, wherein disposing the first dielectric material comprises disposing an inorganic material, and wherein disposing the second dielectric material comprises disposing an organic material.

23. (Original) The method according to Claim 1, wherein disposing the first dielectric material comprises disposing a material that is etchable selective to the second dielectric material.

24. (Original) The method according to Claim 1, wherein disposing the first dielectric material comprises disposing undoped silicate glass (USG), fluorinated silicon glass (FSG), fluorinated tetraethoxysilate (FTEOS), SiCOH, or porous-SiCOH, and wherein disposing the second dielectric material comprises disposing SiLK™ or porous-SiLK™.

25-49. (Cancelled)

50. (New) A method of fabricating a semiconductor device, the method comprising:

- disposing a workpiece in a processing chamber;
- disposing a first dielectric material over the workpiece;
- disposing a second dielectric material over the first dielectric material, the second dielectric material comprising a different material than the first dielectric material, wherein the first dielectric material and the second dielectric material comprise a first insulating layer;
- depositing a hard mask over the second dielectric material, the depositing of said hard mask comprising depositing a first mask layer, depositing a second mask layer over said first mask layer and depositing a third mask layer over the second mask layer;
- forming a first pattern in the first dielectric material;
- cleaning the processing chamber while the workpiece remains in the processing chamber;
- forming a second pattern different from the first pattern in the second dielectric material wherein forming said patterns comprises:
 - patterning at least the third mask layer with the second pattern;
 - patterning the third mask layer, the second mask layer and the first mask layer with the first pattern;
 - transferring the first pattern to the second dielectric material;
 - removing the third mask layer, the second mask layer and the first mask layer in the second pattern regions;
 - transferring the first pattern to the first dielectric material; and
 - removing the second dielectric material in the second pattern regions.

51. (New) The method according to Claim 50, wherein the second dielectric material comprises a top surface, further comprising:

depositing a conductive material over the patterned second dielectric material and the patterned first dielectric material; and

removing the conductive material from the top surface of the second dielectric material.

52. (New) The method according to Claim 51, wherein removing the conductive material from the top surface of the second dielectric material to form comprises forming conductive lines in the second pattern of the second dielectric material.

53. (New) The method according to Claim 51, wherein the conductive material forms vias in the first pattern of the first dielectric material.

54. (New) The method according to Claim 53, wherein the vias comprise substantially vertical sidewalls.

55. (New) The method according to Claim 53, wherein the workpiece comprises component regions, wherein at least one of the vias makes electrical contact with a component region of the workpiece.

56. (New) The method according to Claim 54, wherein the workpiece component regions comprise a plurality of conductive lines formed in a dielectric layer.

57. (New) The method according to Claim 57, wherein the conductive lines comprise copper, wherein disposing the first dielectric material comprises disposing a material having a coefficient of thermal expansion (CTE) close to the CTE of the conductive lines.

58. (New) The method according to Claim 50, wherein depositing the first mask layer comprises depositing SiC_x , SiC_xN_y , SiC_xH_y , $\text{SiC}_x\text{N}_y\text{H}_z$, or SiCOH , wherein depositing the second mask layer comprises depositing Si_xN_y or SiO_2 , and wherein depositing the third mask layer comprises depositing a refractory metal nitride.

59. (New) The method according to Claim 58, wherein depositing the first mask layer comprises depositing a layer of SiC_x and a layer of N-SiC_x over the layer of SiC_x .

60. (New) The method according to Claim 50, wherein cleaning the processing chamber comprises introducing a plasma cleaning gas comprising O_2 gas diluted in Ar, He, or N_2 , and wherein the plasma cleaning gas removes polymer build-up on the processing chamber walls.

61. (New) The method according to Claim 60, further comprising only applying power to an electrode in the chamber during cleaning, wherein the workpiece is not biased during the cleaning method, and wherein the plasma electrode power density applied comprises about 0.1 W/cm^2 to 10 W/cm^2 at a pressure of about 50 mTorr to 500 mTorr.

62. (New) The method according to Claim 50, further comprising:
depositing a cap layer over the workpiece, before disposing the first dielectric material;
and
transferring the first pattern to the cap layer.
63. (New) The method according to Claim 62, further comprising forming an adhesion film over a top surface of the cap layer.
64. (New) The method according to Claim 50, further comprising forming an adhesion film disposed over a top surface of the first dielectric layer.
65. (New) The method according to Claim 50, wherein forming the first pattern and the second pattern further comprises:
after patterning at least the third mask layer with the second pattern, depositing an anti-reflective coating over the third mask layer;
depositing a photoresist layer over the anti-reflective coating;
patterning the photoresist layer with the first pattern; and
transferring the first pattern in the photoresist layer to the third mask layer, the second mask layer, the first mask layer, and the second dielectric layer.
66. (New) The method according to Claim 50, wherein disposing the first dielectric material comprises disposing an inorganic material, and wherein disposing the second dielectric material comprises disposing an organic material.

67. (New) The method according to Claim 50, wherein disposing the first dielectric material comprises disposing a material that is etchable selective to the second dielectric material.

68. (New) The method according to Claim 50, wherein disposing the first dielectric material comprises disposing undoped silicate glass (USG), fluorinated silicon glass (FSG), fluorinated tetraethoxysilate (FTEOS), SiCOH, or porous-SiCOH, and wherein disposing the second dielectric material comprises disposing SiLK™ or porous-SiLK™.

69. (New) A method of fabricating a semiconductor device, the method comprising:

- disposing a workpiece in a processing chamber;
- disposing a first dielectric material over the workpiece;
- disposing a second dielectric material over the first dielectric material, the second dielectric material comprising a different material than the first dielectric material, and wherein the first dielectric material and the second dielectric material comprise a first insulating layer;
- depositing a hard mask over the second dielectric material, the deposition of said hard mask comprising depositing a first mask layer, depositing a second mask layer over said first mask layer and depositing a third mask layer over the second mask layer;
- forming a first pattern in the first dielectric material;
- moving the workpiece to another processing chamber and then removing the second dielectric material to form a second pattern, said second pattern different from the first pattern;

and

- said steps of forming said first and second patterns comprising;
 - patterning at least the third mask layer with the second pattern;
 - patterning the third mask layer, the second mask layer and the first mask layer with the first pattern;
 - transferring the first pattern to the second dielectric material;
 - removing the third mask layer, the second mask layer and the first mask layer in the second pattern regions;
 - transferring the first pattern to the first dielectric material; and
 - removing the second dielectric material in the second pattern regions.

70. (New) The method of Claim 64, wherein the second dielectric material comprises a top surface, further comprising:

depositing a conductive material over the patterned second dielectric material and the patterned first dielectric material; and

removing the conductive material from the top surface of the second dielectric material.

71. (New) The method of Claim 65, wherein removing the conductive material from the top surface of the second dielectric material to form comprises forming conductive lines in the second pattern of the second dielectric material.

72. (New) The method of Claim 66, wherein the conductive lines comprise copper, wherein disposing the first dielectric material comprises disposing a material having a coefficient of thermal expansion (CTE) close to the CTE of the conductive lines.